Federal IRM Training Roadmap:
A Guide for Federal CIOs

**Chief Information Officers Council
Education and Training Committee**

**Draft
January 1999**

Foreword

The Chief Information Officers Council is the principal interagency forum to improve the design, modernization, use, sharing, and performance of resources. The Council's role includes—

➢ developing recommendations for IT management policy, procedures, and standards;

➢ identifying opportunities to share information resources; and

➢ assessing and addressing the needs of the Federal Government for an information technology workforce.

The CIO Council's Education and Training Committee has been charged with examining the complex hiring, training, and development challenges of establishing and maintaining an effective Federal IT workforce. The Committee's approach to addressing these challenges includes—

➢ identifying the information resources management (IRM) core competencies,

➢ leveraging existing training infrastructures (such as the Federal Acquisition Institute, Information Resources Management College, National Defense University, and USDA Graduate School), and

➢ distributing information on skill and training issues and opportunities via the Internet.

In its 1996 planning conference, the CIO Council determined that education and training are major factors in the recruitment and retention of qualified IRM staff and in the ability of CIO organizations to achieve their goals in support of agency missions. At the 1998 FEDCIO conference, CIOs ranked recruiting and retention issues equally with security as second priority for the Council (after Y2K). Given this high level of interest, the Council directed the Education and Training Committee to undertake a study to survey and benchmark core competency training in the Federal Government.

This report is intended to help CIOs plan future IRM training activities by providing information on training initiatives across the Federal Government that are directed toward maintaining or upgrading IRM skills.

Gloria Parker
Chair, Education and Training Committee
Chief Information Officers Council

Leading corporations view training as a strategic resource, an investment*. Federal managers tend to view it as a cost. So in government, worker training isn't even included in most budget estimates for new systems or programs.*

Vice President Al Gore, Report of the National Performance Review

Contents

Executive Summary

The Clinger-Cohen Act has four specific provisions related to training and education. They are—

➢ establishing knowledge and skill requirements,

➢ assessing the degree to which existing staff meet those requirements,

➢ developing strategies and plans to improve staff knowledge and skills, and

➢ reporting on progress in improvement.

Agencies vary in the degree of progress made in implementing these provisions. However, nearly all (25 of 26) of the responding agencies reported that they had taken some action to determine requirements for agency personnel regarding knowledge and skills in IRM.

Agency action is required, because the Act does not define the knowledge and skills required for information resources management staff. However, in February 1997 the CIO Council developed a framework that agencies can use as a roadmap for establishing and evaluating knowledge and skill requirements for agency IRM personnel. This framework is referred to as the "core competencies."

Although nearly all agencies had taken some action to establish knowledge and skill requirements for personnel with information resources management responsibilities, only 16 of 26 had started to assess the extent to which their executive and management-level staff met IRM knowledge and skill requirements. Even fewer (14) reported that they had started to develop plans to rectify deficiencies.

Most CIOs reported that they meet regularly with the agency head to discuss a broad range of topics, including progress in training and education issues.   Only four CIO offices had formally reported to the agency head on progress in improving agency IRM capability.

There was broad consensus among agencies that the knowledge and skill area in shortest supply was project management. Eleven of the CIOs indicated that project management was their greatest need. There were also noteworthy indications of need for knowledge and skills related to the management precepts of the Clinger-Cohen

In an information-based business economy … the race belongs to the companies that build and harness their intellectual capital in the service of company goals.

*Curtis Plott
President and CEO
American Society for Training and Development (ASTD)*

Act. For example, four CIOs said that they considered
capital planning a significant gap, and four listed areas
related to business case development and requirements
analysis. Three CIOs cited strategic use of IT to improve
business processes, and two listed IT architecture as
significant gaps

Training strategies varied among the agencies. Although
most agencies reported having a training unit, most of those
training units concentrated on non-IRM courses, ranging
from managerial and executive courses to communications
and customer service skills. Eight reported having training
units (or individuals) that concentrate on IRM core
competency training.

While IRM personnel in sixteen of the responding agencies
received some core competency training, much of it was
provided in conjunction with planned upgrades to agency
hardware and software – or through individual training paid
from operating funds. Only four agencies reported that
some portion of core competency training was mandatory.

As reflected in the chart below, agency CIOs have made
progress in implementing the training requirements of the
Clinger-Cohen Act, but much remains to be done, especially
in terms of developing training strategies and plans – and
obtaining budgets – to address "gap" deficiencies.
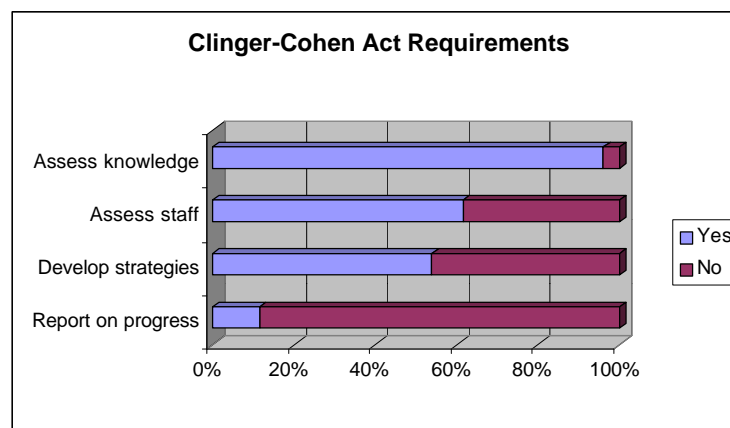
Surveys of private industry are especially interesting in
terms of the emphasis on technical training and the per-
employee investment being made by high technology
companies. These data provide some preliminary
benchmarks against which agency CIOs may begin to
evaluate their approach to investing in intellectual capital.

Still, industry may learn some important lessons from Government in the future, as Federal agencies continue to develop skills in such Clinger-Cohen Act core competencies as IT performance assessment, capital planning, and investment assessment, as well as related skills such as change and program management. In the meantime, continued monitoring of agency progress and sharing emerging best practices seem warranted.

Though the evidence at this point is only indicative, it appears that improved performance is the ultimate outcome of leading-edge firms' investment in training.

1998 State of the Industry Report, ASTD

As part of the annual strategic planning and performance evaluation process, each agency Chief Information Officer shall—

➢ "assess the requirements established for agency personnel regarding knowledge and skill in information resources management and the adequacy of such requirements for facilitating the achievement of the performance goals established for information resources management;

➢ "assess the extent to which the positions and personnel at the executive level of the agency and the positions and personnel at management level of the agency below the executive level meet those requirements;

➢ "in order to rectify any deficiency in meeting those requirements, develop strategies and specific plans for hiring, training, and professional development; and

➢ "report to the head of the agency on the progress made in improving information resources management capability."

excerpted from the Clinger-Cohen Act

OVERVIEW

The Clinger-Cohen Act places on agency CIOs certain training and education responsibilities related to IRM knowledge and skills. This chapter summarizes those requirements and describes the framework of IRM knowledge and skills, referred to as the "core competencies."

What does the Clinger-Cohen Act require in terms of training?

The Clinger-Cohen Act has four specific provisions related to training and education. They are—

➢ establishing knowledge and skill requirements,

➢ assessing the degree to which existing staff meet those requirements,

➢ developing strategies and plans to improve staff knowledge and skills, and

➢ reporting on progress in improvement.

Does the Clinger-Cohen Act identify required knowledge and skills?

No, the Act does not describe the knowledge and skills required for information resources management staff. However, in February 1997 the CIO Council developed a framework that agencies can use as a roadmap for establishing and evaluating knowledge and skill requirements for agency IRM personnel. This framework is referred to as the "core competencies."

What are the Clinger-Cohen core competencies?

The Clinger-Cohen core competencies developed in February 1997 and used for this survey consisted of four major groupings: Federal IRM, capital planning, change management, and managerial/technical.

competency

…can be knowledge, attitudes, skills, or values.

… can be acquired through talent, experience, or training.

… is the effect of personal capability that enables people to perform successfully in their jobs.

1.0 Federal Information Resources Management (IRM) Competencies

    1.1 Policy and Organizational Knowledge:
Department/agency missions, organization, function, policies, procedures, governing laws and regulations, and Federal Government decision-making and policy making process

    1.2 Information Resources Strategy and Planning:
Information technology (IT) assessment analysis, IT planning methodologies, contingency planning, modeling and simulation tools and methods, and monitoring and evaluation methods and techniques

    1.3 IT Acquisition:
Business process reengineering as a foundation for IT acquisition, and alternative acquisition models

2.0 Capital Planning Competencies

    2.1 IT Performance Assessment: Models and methods:
GPRA and IT: Measuring the business value of IT, monitoring and measuring new system development, and effective project/program management

    2.2 Capital Planning and Investment Assessment:
Cost benefit, economic, and risk analysis, risk management models and methods, capital investment analysis models and methods, and investment review process

3.0 Change Management Competencies
Techniques/models of organizational development and change, business process redesign/reengineering, process quality improvement, partnership/team-building techniques, and personnel performance management techniques

4.0 Managerial/Technical Competencies

    4.1 Professional Development and Training:
Defining roles, skill sets, and responsibilities of Senior IRM Officials, CIO, IRM staff and stakeholders; methods for building Federal IT management and technical staff expertise; and competency testing – standards, certification, and performance assessment

    4.2 IT Topics (Knowledge of how these disciplines can be applied to support the mission of the organization and the decision making process):
Data Processing, programming, database management, computer systems architectures, systems analysis, design and testing, telecommunications and networks

    4.3. IT Trends:

Knowledge of intergovernmental, Federal, state, and local projects; knowledge of developing technologies

Is further detail available on the core competencies?

Yes. The core competencies are a three-tiered framework. This level of detail allows agencies to be quite explicit in analyzing, establishing, and evaluating the competencies required of particular programs and positions. The detail is shown in Appendix A.

Have the core competencies been updated?

Yes. Minor changes (not affecting the validity of information and data contained in this report) were approved on September 25, 1998. The September 1998 core competencies are listed for information purposes in Appendix B, and a crosswalk between the 1997 and 1998 versions is in Appendix C to this report.

Chapter 2: Benchmark of Federal IRM Training

OVERVIEW

Each agency CIO is responsible for implementing the IRM training provisions of the Clinger-Cohen Act. To assess the progress made to date and establish a benchmark, the CIO Council's Education and Training Committee conducted a "Survey of Federal Chief Information Officers in Clinger-Cohen Act, Core Competency Training Issues" in the first half of 1998. This chapter summarizes the results of the benchmark of Federal IRM training as revealed by the survey. (Details on survey methodology are in Appendix D, and a list of agencies represented on the CIO Council is in Appendix E.)

IMPLEMENTING THE CLINGER-COHEN ACT REQUIREMENTS

Has your agency established requirements for agency personnel regarding knowledge and skills in IRM?

Nearly all (25 of 26) of the responding agencies reported that they had taken some action to determine requirements for agency personnel regarding knowledge and skills in IRM. Ten agencies reported that they had specific programs planned or started to determine knowledge and skill requirements for their staff. The scope of the efforts varied. Several agencies were defining new core competencies for CIO and IRM staff, while one agency (Social Security Administration) reported that it was developing IRM knowledge and skill requirements for *all* managers.

The Labor CIO reported that she had met with each person in the CIO organization to discuss knowledge and skill requirements. Each person now has an individual development plan.

What has been your agency's experience so far in assessing the extent to which executive level and management level positions and personnel meet those requirements?

Although nearly all agencies had taken some action to establish knowledge and skill requirements, only 16 of 26 had started to assess the extent to which their executive and management-level staff met IRM knowledge and skill requirements. Three agencies – the Department of Labor, Nuclear Regulatory Commission (NRC), and the Securities and Exchange Commission – reported that they had completed skills assessments of their CIO organizations. One agency, the National Science Foundation (NSF), assessed all staff

with information technology responsibilities. Several others were planning assessments in the next year.

Has your agency begun to develop strategies and plans to rectify any deficiencies in meeting those requirements through hiring, training, or professional development?

The Interior CIO reported the development of a skills and experience inventory for its computer specialists that will serve as the basis for individual development and career plans.

Fourteen agencies reported that they had started to develop plans to rectify deficiencies, and one agency (NSF) had completed a training plan for all IT staff based on the core competencies. The plan utilizes the USDA Graduate School, the Office of Personnel Management (OPM) Management Development Program, and GSA's 1000 by 2000 and Trail Boss Programs.[1] Another agency, the Department of Interior, includes IRM training in its strategic planning process with a training goal of 80 hours per employee every two years. The Department of Treasury has developed a core curriculum for computer specialists and an IT training track in its Treasury Executive Institute. The Department of Defense has three ongoing programs for its personnel. The Information Resources Management College offers the CIO Certificate Program and the Advanced Management Program, using the Clinger-Cohen competencies as the framework for program development. The Defense Acquisition University offers project management training for personnel with acquisition, project and program management responsibilities.

Has a report been prepared for the agency head on progress in improving agency IRM capability?

Ten CIO offices had done work in this area, with eight having some action in progress and four having formally reported to the head of the agency. Most CIOs reported that they meet regularly with the agency head to discuss a broad range of topics, including progress in training and education issues.

THE MOST SIGNIFICANT GAPS IN IRM KNOWLEDGE AND SKILLS AMONG FEDERAL EMPLOYEES

---

[1] GSA's 1000 by 2000 is a graduate level IRM certificate program and Trail Boss is a project management (acquisition and implementation) program. (See Appendix F for sources of IRM training.)

6

What do you consider to be the most significant gaps in knowledge or skills in IRM among staff in your agency?[2]

There was broad consensus among agencies that the knowledge and skill area in shortest supply was project management. Eleven of the CIOs indicated that project management was their greatest need. In several cases, this need was driven by organizational redesign – away from in-house computer programming and systems operations to a model in which staff members manage contractors who develop and run agency systems. To make this change, these agencies are placing much greater emphasis on program and project management than they had in the past. For example, the Department of Defense has a formalized training program (based on the requirements of the Defense Acquisition Workforce Improvement Act) which is designed specifically to train project and program managers.

No other single area got more than four votes individually, but there were noteworthy indications of need for knowledge and skills related to the management precepts of the Clinger-Cohen Act. For example, four CIOs said that they considered capital planning a significant gap, and four listed areas related to business case development and requirements analysis. Three CIOs cited strategic use of IT to improve business processes, and two listed IT architecture. This gap assessment may have been best represented by one CIO who listed broader knowledge of the Clinger-Cohen Act as one of his agency's greatest needs.

The management skills necessitated by the Clinger-Cohen Act, such as capital planning, investment analysis, and business case development, were noted by some agencies as significant gaps.

FEDERAL IRM TRAINING: INITIATIVES AND BUDGET

Does your agency have a training unit (or individual) responsible for designing, purchasing, or providing IRM training? Does it provide technical core competency training and/or end-user productivity?[3]

Training strategies varied among the agencies. Although most agencies reported having a training unit, most of those training units concentrated on non-IRM courses, ranging from managerial

Department of Defense agencies share two inter-service training units: the Defense IRM College and the Defense Acquisition University.

---

[2] "Gap analysis" is an assessment of the knowledge and skills necessary to perform a function and assessment of knowledge and skills possessed by staff performing the function, in order to determine if training is needed to fill any gaps between desired and actual performance. See Appendix G for other definitions.

[3] End-user productivity refers to training in such office automation / desktop applications as word processing, spreadsheets, e-mail, etc.

and executive courses to communications and customer service skills. However, eight agencies did report having training units (or individuals) that concentrate on IRM core competency training. Those agencies are the Department of Defense (DoD) and its services (Army, Navy, and Air Force), Treasury, the Patent and Trademark Office (PTO) of the Department of Commerce, the Central Intelligence Agency, and the NRC. Other CIOs said that they have individuals designated as training coordinators to facilitate IRM training – or that they rely on outside sources for their training.

Have you (CIO or agency) provided any core competency training for your staff?

While IRM personnel in sixteen of the responding agencies received some core competency training, much of it was provided in conjunction with planned upgrades to agency hardware and software – or through individual training paid from operating funds. As mentioned above, there were only eight agencies that had training operations focused primarily or exclusively on IRM core competencies, and few had separate CIO-controlled budgets earmarked for core competency training.

The agency training programs cited by respondents range from very formal schools with thick course catalogs, to very informal programs in which each individual works with his or her supervisor to plan training. Even for agencies with large training programs, much of the training was developed or purchased from outside the agency.

The Government has several in-house sources of training, including the GSA Trail Boss program and the OPM management development program. In addition, GSA sponsors the IRM certificate program (1000 by 2000) which dozens of universities and colleges support.

Has your agency made training in any core competency areas mandatory?

Only four agencies – NRC, PTO, Social Security Administration (SSA), and DoD – reported that core competency training was mandatory:

➢ NRC requires executive IT training for all managers and executives.

➢ PTO requires training in certain system development tools and attendance at the "Managing Information Technology Series."

- ➢ SSA requires any project leader who will be involved in a procurement exceeding $25,000 to take an official Project Officer Training Course.

- ➢ DoD requires every project and program manager to complete the Defense Acquisition University's project management training at the career level of the acquisition position occupied.

Do you have funds available in your budget to purchase or develop Clinger-Cohen Act core competency training?

Only eight of the responding agencies reported that funds were available in the budget for Clinger-Cohen Act core competency training. They were the Departments of Education, State, and Treasury as well as the Agency for International Development, NRC, NSF, PTO, and SSA.

CIOs' PRIORITIES

Which core competencies do you consider to be the highest priority in your agency for each population group?

Not surprisingly, the core competencies the CIOs chose and their rank varied by population group. Policy and organizational knowledge was the near unanimous top-rated selection of CIOs for both political appointees and SES-level executives. This core competency includes knowledge of department or agency policy, organization, decision-making, and authorizing legislative and regulation.

Another notable area of consensus was that of change management. CIOs chose it as one of the three top-ranked core competencies for *each* population group – and as the top-ranked competency for both program managers and end users. Change management requires knowledge and skills in areas such as organizational development and change, business process reengineering, process quality improvement, partnership-building techniques, and personnel performance management techniques.

Change management recognizes the new constancy of change that Federal agencies are facing on the eve of the next millennium.

Priority Ranking of Core Competencies by Population Group					
Priority	**Political Appointees**	**Executive Level (SES)**	**Program Managers (GS 14&15)**	**Other End-Users**	**CIO/IRM Organization**
First	Policy and Organizational Knowledge	Policy and Organizational Knowledge	Change Management	Change Management	IT Performance Assessment
Second	Change Management	Change Management	IT Acquisition	IT Performance Assessment	Change Management
Third	IT Performance Assessment	Capital Planning and Investment Assessment	Policy and Organizational Knowledge *and* Information Resources Strategy and Planning (tie)	IT Topics	Professional Development and Training

As though in affirmation of the appropriateness of the core competencies, all received a substantial number of votes, and all but one (IT trends) were ranked in the top three for at least one of the five population groups.

While all of the core competencies received some votes, three core competency areas were especially notable, ranked as first priority at least once and as either second or third for another population group. These notable core competencies are:

➤ Policy and organizational knowledge,

➤ Change management, and

➤ IT performance assessment.

The latter was top-ranked for the CIO/IRM organization, second-ranked for other end-users, and third-ranked for political appointees. These three skill areas reflect a mix of both traditional and the more contemporary bodies of knowledge and skills emphasized by the Government Performance and Results Act and the Clinger-Cohen Act.

Distribution of Core Competencies by Population Group					
Core Competency Number	**Political Appointees**	**Executive Level (SES)**	**Program Managers (GS 14&15)**	**Other End-Users**	**CIO/IRM Organization**
1.1	1	1	3		
1.2			3		
1.3			2		
2.1	3			2	1
2.2		3			
3.0	2	2	1	1	2
4.1					3
4.2				3	
4.3					

EFFECTIVE PRACTICES IN FEDERAL IRM TRAINING

While it is clear from the benchmark results that much remains to be done to implement the training-related provisions of the Clinger-Cohen Act, there are some promising practices. The following are highlights.

➢ To help rectify the deficit of skilled information technology personnel, the PTO CIO's office had hired 43 people in the computer scientist series over the previous 18 months. The PTO also had established, as part of the PTO University, certificate programs at both the undergraduate and graduate levels, to provide training to information technology specialists and users. PTO partnered with The George Washington University to provide a Masters-level Certificate program in Information Systems Management, and to expand the Northern Virginia Community College Certificate program to include an Associate in the Arts program for Information Systems Technology.

PTO's Office of the Chief Information Officer also had established the Managing Information Technology (MIT) Series. MIT is a series of five classes developed in-house, the

objective of which is to increase the level of understanding about the information technology processes and tools in use at the PTO. This series is offered once a quarter, and attendance is mandatory for all OCIO personnel.

➤ The NSF CIO reported that it provides end-user productivity training in many ways. However, the most recent and effective are "roving trainer," web-based commercial courses, personal orientation to the computing environment, and briefings for agency-wide product upgrades.

Roving trainer is a service offered on request. An office or workgroup may request that a trainer visit them for a few hours or a whole day, and go from desk to desk and answer specific questions. This achieves very high relevance for the trainee and totally personalized training geared to an individual's skills level and learning personality.

NSF reported that "the convenience of this 'your time, your place, your skills need' service is proving very popular. It puts minimal demands on our training staff – it is a self-learning method."

A second method the NSF CIO introduced shortly before the survey is access to over 25 commercial, web-based, intranet-accessed courses in common desktop products. Modules are short, typically about five minutes, and the service includes self-assessment quizzes and recommendations to the individual for very specific modules.

Because NSF relies on the temporary (one to two-year) assignment of senior scientists, the agency has a recurring need to train new employees. The CIO office's solution is to offer one-on-one orientation to the NSF computing environment. This method accommodates very busy schedules and the need for very relevant, personalized instruction.

NSF reported, "We find that we are reaching more people this way than by offering a class, and, it has not taxed our staff. We are meeting the demand. It shortens the learning curve, gives the new employee a personal contact for learning, provides a comfort level with the computer and computer support, and immediate work-related skills."

When a product such as a word processor or spreadsheet program is upgraded to a new version, NSF has found that it is most effective to offer on-request briefings that highlight the differences between the old and the new versions. These are most often scheduled as part of regular staff meetings, so the learning is incorporated with a management-initiated routine in a familiar setting. NSF reported, "The work group members are familiar to each other, so digressions and personalities are better tolerated. Their 'local culture' or style can be accommodated, addressing issues that are unique to an office. The timing of the learning is driven by the workgroup – peer pressure and natural leadership lead to the request 'let's find out about this.' We have a captive audience, with the manager

of the group present and often highly supportive of the change."

➤ The Department of the Army CIO reported that it has established information management/information technology (IM/IT) core competencies for the Army's Career Program 34 (CP-34) Army Civilian Training, Education and Development System Plan. The Army IM/IT CP-34 core competencies address 14 knowledge areas and indicate for each the level of proficiency (introductory, basic, and proficient) expected at four levels:

- ◆ Entry (GS-1 to GS-8)
- ◆ Journeyman (GS-9 to GS-12)
- ◆ Manager (GS-13 to GS-15)
- ◆ SES

➤ The Department of the Air Force CIO reports that the DoD CIO certification program at the National Defense University, which provides training in key Clinger-Cohen Act competency areas, is a best-practice example.

The AF CIO also cited as a best practice the Air Force Institute of Technology Graduate Information Resource Management Program (GIR). The GIR program is designed to provide students with the knowledge and skills needed to oversee the data management and information systems needs of Air Force and DoD organizations in future assignments as middle and upper-level managers in the communications officer career field. This 18-month resident program culminates in the award of a Master of Science in Information Resource Management.

Air Force is updating its Career Field Education and Training Plans and Master Development Plans to include IRM principles. The AF-CIO web page – http://www.cio.hq.af.mil/ittrng.htm – provides details.

➤ The Treasury Department has established an IT Workforce Improvement Program Office to study and act on initiatives for recruitment, retention, and development of its more than 9,000 IT workers. The Department also has an IT Skills Enhancement Committee composed of Treasury bureau representatives who meet monthly to discuss strategies and plans.

➤ The Nuclear Regulatory Commission is undergoing a paradigm shift in IT management. It is implementing an IT Capital Planning and Investment Control program and is defining IT

architecture and standards. As a means to implement this paradigm shift, NRC requires IT training of all of its managers and executives. The training is taught by the CIO and other members of NRC's senior information resources management team as a means to encourage better communications between program and IT managers.

Chapter 3: Results of Other Research on Training and Education

OVERVIEW

This chapter provides information related to results of other key research on training and education.

BUREAU OF LABOR STATISTICS SURVEY OF EMPLOYER-PROVIDED TRAINING

In 1995, the Bureau of Labor Statistics (BLS) conducted a survey of employer-provided training at 1,800 organizations with 50 or more employees. BLS found that the surveyed employees received over a six-month period an average of 44.5 hours of training. Of these total training hours, 31.1 hours (70 percent) were informal training, while 13.4 hours (30 percent) were formal training.[4] The survey also found that an estimated $647 per employee was spent on wage and salary costs of training, with about 65 percent of the amount spent on informal training.

The most common type of job-skill training – both formal and informal – was computer training. Thirty-eight percent of employees received formal computer training and 54 percent received informal training.

Hours of Training per Employee by Type of Training			
Characteristic (Type of Training)	**Hours of Training**		
	Total	**Formal**	**Informal**
Job Skills			
Management	1.7	.6	1.1
Professional / Technical	6.2	1.9	4.3
Computer-related	11.8	5.1	6.8
Clerical / Administrative	3.4	.6	2.8
Sales / Customer Relations	3.2	.6	2.6
Service-related	2.1	.3	1.8
Production / Construction	10.6	2.0	8.6
General Skills			
Basic	.3	.0	.2
Occupational Safety	2.4	.6	1.8
Communications	2.6	1.5	1.2
Other	.2	.2	.0
TOTAL (6 months)	**44.5**	**13.4**	**31.1**

Source: BLS News Release, USDL 96-515, December 19, 1996

[Note: Table accurately reflects BLS data. Not all columns and rows total.]

---

[4] Formal training was defined as training that was planned in advance and had a structured format and defined curriculum.

BLS also found (predictably) that the amount of training an employee received differed notably based on occupation. More investment was made in workers whose occupation was identified as professional, paraprofessional, or technical than in other occupations.

Hours of Training per Employee by Occupation (6 Months)			
Characteristic (Occupation)	Hours of Training		
	Total	Formal	Informal
Managerial and Administrative	26.7	4.3	22.4
Professional, Paraprofessional, or Technical	61.1	22.3	38.7
Service	27.7	5.6	22.1
AVERAGE: All Employees	**44.5**	**13.4**	**31.1**

Source: BLS News Release, USDL 96-515, December 19, 1996

Note: Totals may not add due to rounding.

AMERICAN SOCIETY FOR TRAINING AND DEVELOPMENT

Compared with other organizations, leading-edge firms typically spend more money on training, sometimes up to 6 percent of payroll. They also train a bigger percentage of their employees and maintain a lower employee-to-trainer ratio.

1998 State of the Industry Report, ASTD

In January, the American Society for Training and Development (ASTD) released its 1998 State of the Industry Report (which relies on data from its Human Performance Practices Survey). This "landmark study of human performance practices reveals new insight about the amount and focus of investments in human capital and, more importantly, about the links between that investment, innovative work practices, and performance," according to Curtis Plott, President and CEO of ASTD.

The statistical information the report makes available is important, especially given the fact that quantitative information about investment in training and its effect on performance is not generally available – in either the private or public sector. As the ASTD report indicates, "generally accepted accounting practices do not require that a firm document the investment it makes in the learning and development of its workforce."

That investment can be significant, as the report indicates. By far, the largest total training expenditure per employee by industry

occurs in the high technology[5] industry group: $911. (The next highest is $567 in the finance, insurance, and real estate industry group.)

Other highlights from the report follow.

➢ "More than 25 percent of all training time is spent on job-specific technical skills and computer skills."

➢ "Organizations in the Human Performance Practices survey said that the most significant issue they face in the next several years is training employees to use new technologies."

➢ The high technology industry was third-highest in the percentage of employees trained: 71 percent.

➢ "Training expenditures as a percentage of payroll grew from an average of 2.1 percent in 1995 to 2.27 percent in 1996."

➢ Ninety-one percent of organizations offered training in computer literacy and applications

---

[5] Defined for the survey to include computer, communications, and pharmaceutical manufacturers; biological and physical researchers; and software designers.

Conclusion

Agency CIOs have made progress in implementing the training requirements of the Clinger-Cohen Act. Nearly all (25 of 26) of the responding agencies reported that they had taken some action to determine requirements for agency personnel regarding knowledge and skills in IRM. However, only 16 had started to assess the extent to which their executive and management-level staff met IRM knowledge and skill requirements, and only 14 reported that they had started to develop plans to rectify deficiencies. Finally, only four CIOs reported that he or she had formally reported to the agency head on progress in improving agency IRM capability.

Clinger-Cohen Act Requirements
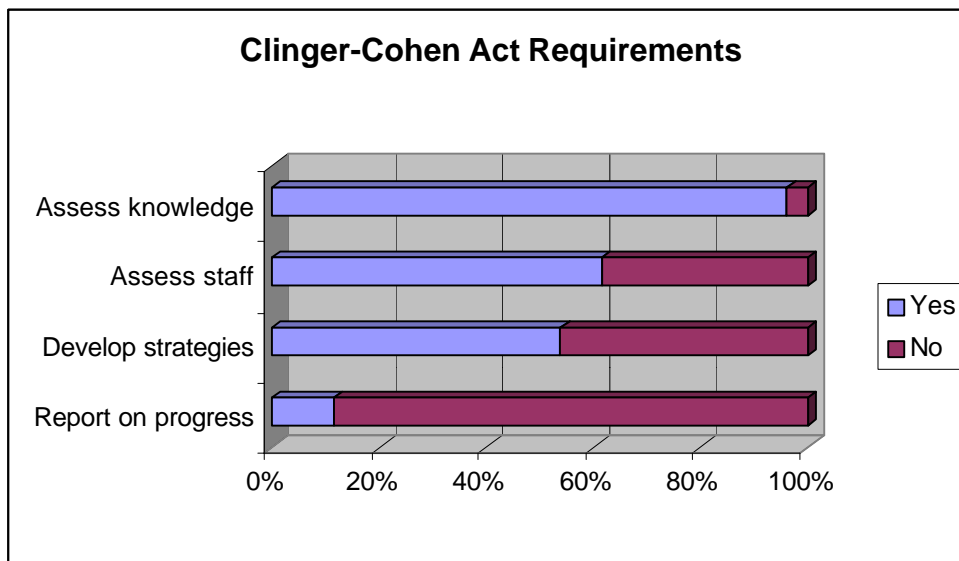
Clearly, much remains to be done. At the time the survey was taken, slightly less than half had completed their staff assessments, and about half had yet to develop strategies. Given the long lead time required to prepare the budget request and acquire funding approval, the development of training strategies and plans to address "gap" deficiencies is crucial. Further, of those who had completed the staff assessment and development of strategies, only four had formally reported to the agency head – an action that could (and should) generate support for the CIO in the area of strengthening agency core competency skills.

Data from surveys of Federal Government, counterparts in private industry show an emphasis on technical training and high per-employee investment. These data provide some preliminary benchmarks against which agency CIOs may begin to evaluate their approach to investing in human capital.

Still, industry may learn some important lessons from Government in the future, as Federal agencies continue to develop skills in such Clinger-Cohen Act core competencies as IT performance assessment, capital planning, and investment assessment, as well as related skills such as change and program management. In the meantime, continued monitoring of agency progress and sharing emerging best practices seem warranted.

Appendix A: February 1997 Core Competency Areas
(Used in Survey)

1.0 FEDERAL IRM

1.1   POLICY AND ORGANIZATIONAL KNOWLEDGE
1.1.1   Knowledge of agency missions, organization, policies, etc.
1.1.2   Knowledge of governing laws and regulations
1.1.3   Knowledge of Federal decision- and policy-making process
1.1.4   Understanding of links among agency head, COO, CIO, CFO
1.1.5   Intergovernmental programs, policies, and processes

1.2   INFORMATION RESOURCES STRATEGY AND PLANNING
1.2.1   IT baseline assessment analysis
1.2.2   Interdepartmental, inter-agency IT functional analysis
1.2.3   IT planning methodologies
1.2.4   Contingency planning
1.2.5   Modeling and simulation tools and methods
1.2.6   Monitoring and evaluation methods and techniques

1.3   IT ACQUISITION
1.3.1   Alternative functional approaches analysis
1.3.2   Business process reengineering as foundation for IT acquisition
1.3.3   Alternative acquisition methods
1.3.4   Streamlined acquisition methods
1.3.5   Post-award IT contract management models and methods
1.3.6   IT acquisition best practices

2.0 CAPITAL PLANNING

2.1   IT PERFORMANCE ASSESSMENT: MODELS/METHODS
2.1.1   GPRA and IT: Measuring the business value of IT
2.1.2   Monitoring and measuring new system development
2.1.3   Effective project/program management
2.1.4   Measuring IT success: practical and impractical approaches
2.1.5   Processes and tools for surveying
2.1.6   Techniques for defining and criteria for performance measures
2.1.7   Examples of defining and criteria for performance evaluations
2.1.8   Managing IT reviews and oversight processes

2.2   CAPITAL PLANNING AND INVESTMENT ASSESSMENT
2.2.1   Best practices
2.2.2   Best value cost-technical tradeoff analysis
2.2.3   Cost Benefit, economic, and risk analuysis
2.2.4   Risk management – models and methods
2.2.5   Weighing benefits of alternative IT investments
2.2.6   Capital investment analysis – models and methods

2.2.7   Business case analysis
2.2.8   Integrating performance with mission and budget process
2.2.9   Investment review process
2.2.10   Cost as an independent variable (CAIV)
2.2.11   Managing IT review and oversight process

3.0 CHANGE MANAGEMENT

3.1   TECHNIQUES OF PROCESS MANAGEMENT/CONTROL
3.2   BUSINESS PROCESS REDESIGN/REENGINEERING
3.3   TECHNIQUES OF ORGANIZATIONAL DEVELOPMENT
3.4   PROCESS QUALITY IMPROVEMENT METHODS
3.5   PARTNERSHIP/TEAM-BUILDING TECHNIQUES
3.6   PERSONNEL PERFORMANCE MANAGEMENT

4.0 MANAGERIAL/TECHNICAL

4.1   PROFESSIONAL DEVELOPMENT AND TRAINING
4.1.1   Defining roles, skill sets, and responsibilities of IRM staff
4.1.2   Methods for building IT staff's management/technical expertise
4.1.3   Competency testing: standards, certification, assessment

4.2   IT TOPICS
4.2.1   Data processing
4.2.2   Programming
4.2.3   Database management
4.2.4   Computer systems architectures, client/server, collaborative
4.2.5   Systems analysis, design and testing
4.2.6   Telecommunications and networks
4.2.7   Information technology application
4.2.8   Internet structure and applications, www, email, etc.
4.2.9   Software engineering, life-cycle development process, testing
4.2.10   Security and policy
4.2.11   Information systems management

4.3   IT TRENDS
4.3.1   Knowledge of intergovernmental, Federal, state, local projects
4.3.2   Knowledge of developing technologies.

Appendix B: September 1998 Core Competency Areas

1.0 Policy and Organizational

1.1 Department/Agency missions, organization, function, policies, procedures
1.2 Governing laws and regulations (e.g., Clinger-Cohen, GPRA, PRA)
1.3 Federal government decision-making, policy making process and budget
      formulation and execution process
1.4 Linkages and interrelationships among Agency Heads, COO, CIO, and CFO
      functions
1.5 Intergovernmental programs, policies, and processes
1.6 Privacy and security
1.7 Information Management

2.0 Leadership/Managerial

2.1 Defining roles, skill sets, and responsibilities of Senior IRM Officials, CIO,
      IRM staff, and stakeholders
2.2 Methods for building federal IT management and technical staff expertise
2.3 Competency testing - standards, certification, and performance assessment
2.4 Partnership/team-building techniques
2.5 Personnel performance management technique
2.6 Practices which attract and retain qualified IT personnel

3.0 Process/Change Management

3.1 Modeling and simulation tools and methods
3.2 Quality improvement models and methods
3.3 Techniques/models of organizational development and change
3.4 Techniques and models of process management and control models and
      methods

4.0 Information Resources Strategy and Planning

4.1 IT baseline assessment analysis
4.2 Interdepartmental, inter-agency IT functional analysis
4.3 IT planning methodologies
4.4 Contingency planning
4.5 Monitoring and evaluation methods and techniques

5.0 IT Performance Assessment: Models and Methods

5.1 GPRA and IT: Measuring the business value of IT
5.2 Monitoring and measuring new system development: When and how to "pull the plug" on systems
5.3 Measuring IT success: practical and impractical approaches
5.4 Processes and tools for creating, administering and analyzing survey questionnaires
5.5 Techniques for defining and selecting effective performance measures
5.6 Examples of and criteria for performance evaluation
5.7 Managing IT reviews and oversight processes

6.0 Project/Program Management

6.1 Project scope/requirements management
6.2 Project integration management
6.3 Project time/cost/performance management
6.4 Project quality management
6.5 Project risk management
6.6 Project procurement management

7.0 Capital Planning and Investment Assessment

7.1 Best practices
7.2 Cost benefit, economic, and risk analysis
7.3 Risk management-models and methods
7.4 Weighing benefits of alternative IT investments
7.5 Capital investment analysis - models and methods
7.6 Business case analysis
7.7 Integrating performance with mission and budget process
7.8 Investment review process
7.9 Intergovernmental, Federal, State, and Local Projects

8.0 Acquisition

8.1 Alternative functional approaches (necessity, government, IT) analysis
8.2 Alternative acquisition models
8.3 Streamlined acquisition methodologies
8.4 Post-award IT contract management models and methods, including past performance evaluation
8.5 IT acquisition best practices

9.0 Technical

  9.1 Information Systems Architectures client/server, collaborative processing,
       telecommunications
  9.2 Emerging/Developing Technologies
  9.3 Information Delivery Technology (internet, intranet, kiosks, etc.)
  9.4 Security policy, disaster recovery, and business resumption
  9.5 System life cycle
  9.6 Software Development
  9.7 Data Management

10.0 Desktop Technology Tools

Appendix C: Crosswalk between February 1997 and September 1998 Core Competency Lists

(See Appendices A [p. 21] and B [p.23])

Revised list substitutes a one-sentence statement for the three recommendations introducing the original list of competencies.

Revised list numbers each competency.

Original list had 59 competencies. Revised list has 57 competencies.

Revised list adds 8 competencies:

- Information Management (1.7)
- Practices which attract and retain qualified IT personnel (2.6)
- Project scope/requirements management (6.1)
- Project integration management (6.2)
- Project time/cost/performance management (6.3)
- Project quality management (6.4)
- Project risk management (6.5)
- Project procurement management (6.6)
- Desktop Technology Tools (9.0)

Revised list deletes 5 original competencies:

- Business process reengineering as a foundation for IT acquisition (old 1.3.2)
- Manage IT reviews and oversight process (old 2.2.11 duplicated old 2.1.8)
- Best value cost-technical tradeoff analysis (old 2.2.2)
- Cost as independent variable (CAIV) (old 2.2.10)
- Information Technology Application (old 4.2.7)

Revised list combines 5 original competencies with other competencies:

- Software Engineering, Software Development Lifecycle, Process, Testing (old 4.2.9) and Programming (old 4.2.2) combined under name of Software Development (new 9.6).

- Systems Analysis, Design, and Testing (old 4.2.5), Information Systems Management (old 4.2.11), and Data Processing (old 4.2.1) combined under new name System Life Cycle (new 9.5).
- Computer Systems Architecture client/server, collaborative processing (old 4.2.4) and Telecommunications and Networks (old 4.2.6) combined under Information System Architecture (new 9.1).

Revised list changes or deletes words in 15 competencies or category names.

Original list had four categories with subcategories. Revised list has ten categories with no subcategories.

Revised list rearranges some competencies under different categories than in original list.

Appendix D: Methodology

This survey was undertaken at the direction of the Federal CIO Council. It was intended to provide CIOs with baseline information on training initiatives in the Federal Government directed toward maintaining or upgrading information resources management (IRM) skills.

The survey was administered to CIOs who were members of the Federal CIO Council and other Federal CIOs who volunteered to participate. The survey was prepared by the Education and Training Committee (Committee) and mailed to CIOs in mid-January 1998. Responses were collected between February and June 1998. Responses were compiled and analyzed between June and September 1998.

In most cases, members of the Committee personally interviewed the CIO or Deputy CIO to obtain responses to the surveys. In some cases, agencies submitted written responses to the survey either in lieu of or in addition to the in-person interview. Several agencies also submitted written materials such as course catalogs, skill assessment methodologies or tools, or training plans.

The survey was in two sections. Section one contained questions for the CIO dealing with implementation of the training provisions of the Clinger-Cohen Act. Section two contained questions for each organization's IRM training staff or unit. The survey was posted on the CIO Council Web page and mailed directly to each CIO Council member. Twenty-six Federal CIOs participated in the survey. Twenty-four were members of the Federal CIO Council.

In most cases, survey responses were summarized by grouping and counting the answers. In question four, however, the analysis was more complex. In this question we asked CIOs to rank order the core competencies (first, second, and third priority) for each of five population groups:

➢ Political Appointees,
➢ Career Senior Executives (SES),
➢ Program Managers (GS-14s and GS-15s),
➢ Staff working in the Chief Information Officer and/or Information Resources Management Organizations (CIO/IRM), and
➢ Other end-users.

For this question we summarized the core competencies in order to reduce the size of the list the CIOs would choose from. We kept the four major and eight sub-categories from the CIO Council's February 1997 list, but summarized, into short descriptive statements, the nearly 60 detailed core competencies listed under the eight sub-categories. Appendix A contains the list of core competencies that we used for the survey. In most cases, the CIOs selected their priorities at the subgroup level. A few selected at the major category level. In addition, CIOs did not always select exactly three priorities for each population group; some selected fewer and some more than three. For example, one CIO selected two core competencies as first priority for program managers and three first priorities for CIO/IRM organizations.

In these cases we adjusted the scores by assigning a percentage of a vote based on the number of votes cast. For example, if a CIO voted for two first priorities, we assigned a score of .5 to each or .33 if they voted for three. In determining rankings, we used a weighted score of 10 points for a first priority vote, five points for second priority, and one point for third priority. Where a CIO voted more than once, we assigned the percentage to these weighted scores, 10, 5, or 1 point.

Appendix E: Federal CIO Council
Member Agencies

Department of Agriculture

Department of the Air Force

Department of the Army

Department of Commerce

Department of Defense

Department of Education

Department of Energy

Department of Health and Human Services

Department of Housing and Urban Development

Department of the Interior

Department of Justice

Department of Labor

Department of the Navy

Department of State

Department of Transportation

Department of the Treasury

Department of Veterans Affairs

Agency for International Development

Central Intelligence Agency

Environmental Protection Agency

Federal Emergency Management Agency

General Services Administration

National Aeronautics and Space Administration

National Science Foundation

Nuclear Regulatory Commission

Office of Personnel Management

Small Business Administration

Social Security Administration

Small Agency Liaison:

    Federal Energy Regulatory Commission

    Peace Corps

Appendix F: Sources of IT Training

Federal Acquisition Institute

Defense Acquisition University

General Services Administration

      1000 by 2000
      CIO University
      Trail Boss

Information Resources Management College

National Defense University

OPM Management Development Program

USDA Graduate School

Appendix G: Definitions of Terms Used in Survey

Chief Information Officers Council: Established by Executive Order 13011 dated July 16, 1996, as the principal interagency forum to improve agency practices on such matters as the design, modernization, use, sharing, and performance of agency information resources.

Clinger-Cohen Act (CCA): The CCA replaced the Brooks Act with respect to IT management and acquisition, requiring Federal agencies to adopt performance- and results-based management approaches to the acquisition, use, and disposal of IT. Major features of this approach include capital investment and planning, use of performance measures, and reengineering business processes before developing or redesigning information systems. [Note: The IT provisions of this Act were originally named the "Information Technology Management Reform Act of 1996," but were subsequently renamed (with other provisions) as the Clinger-Cohen Act of 1996 by a provision contained in the Omnibus Consolidated Appropriations Act of 1997.]

Core Competencies: On February 19, 1997, the CIO Council approved a list of Clinger-Cohen Core Competency Areas. (See Appendix A.) The competency areas were designed to fulfill four requirements: (1) to meet the requirements of Section 5215(c)(3)(A) and serve as the Federal "requirements established" for personnel; (2) to be used to assess the skill and knowledge requirements of employees; (3) to serve as a tool in human resource planning and management; and (4) to serve as a baseline to determine required course and curriculum training development requirements in the information resources management field. The core competencies, revised in September 1998 (see Appendix B), serve as a baseline to assist Government agencies in complying with Section 5215(C)(3) of the Clinger-Cohen Act.

Gap Analysis: Assessment of knowledge and skills necessary to perform a function and assessment of knowledge and skills possessed by staff performing the function, in order to determine if training is needed to fill any gaps between desired and actual performance.

Information Resources: Information and related resources such as personnel, equipment, funds, and information technology.

Information Resources Management (**IRM**): The process of managing information resources to accomplish agency missions and to improve agency performance, including the reduction of collection burdens on the public. IRM includes the following six areas: security, information technology, privacy, access to records, records management, and paperwork burden.

Information Technology (**IT**): Any equipment or interconnected system or subsystem of equipment that is used in the automatic acquisition, storage, manipulation, management, movement, control, display, switching, interchange, transmission, or reception of data or information by the executive agency.

Appendix H: Major Contributors to this Effort

Jim Bouck, U.S. General Accounting Office

Shannon Collins, Department of Labor

Ann Costello, Acquisition Solutions, Inc.

Kay Monte-White, Department of State